HAEMATOLOGICAL AND BIOCHEMICAL INDICES OF YANKASA RAMS FED BAOBAB (*Adonsonia digitata*) SEED MEAL AS A PROTEIN REPLACEMENT FOR COWPEA HUSK IN BAUCHI METROPOLIS

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ABSTRACT
A study was conducted to assess the haematological and biochemical indices of Yankasa rams fed diets containing baobab seed meal as a protein replacement for cowpea husk. The study was conducted at the Abubakar Tafawa Balewa University Teaching and Research Farm, Bauchi. Sixteen (16) Yankasa rams were used. The animals were randomly allocated to four dietary treatments groups A, B, C and D in a completely randomised design (CRD). Feeds and water were offered ad-libitum, while the feeding trial lasted 84 days. Blood samples were collected and analysed for various parameters. The results showed that, red blood cells (RBC), white blood cells (WBC), haemoglobin (HB), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), were not affected (P>0.05) by the dietary treatments. Glucose, protein, albumin and blood urea nitrogen were also not significantly (P>0.05) influenced by the dietary treatments. It was concluded that, baobab seed meal as a protein source did not affect haematological and biochemical parameters of the animals Therefore, the use of baobab seed meal is recommended as a protein source for optimum production in ruminant animals.
Keywords: Yanksa rams, Baobab seed meal, Cowpea husk, Haemato-biochemical indices

INTRODUCTION

The African Baobab (*Adansonia digitata*,) is a traditional food plant in Africa, but is little-known elsewhere.The leaves have been suggested to have potential to improve nutrition, boost food security, foster rural development, and support sustainable land care (NRC, 2006). The dry pulp is either eaten fresh or dissolved in milk or water to make a drink. The leaves can be eaten fresh, young fresh leaves are cooked in a sauce and sometimes are dried and powdered. The powder is called *Kuka* in Hausa and sold in many village markets. The oil extracted by pounding the seeds can be used for cooking but this is not widespread (Sidibe *et al*. 2002). Studies on baobab seeds in Nigeria and elsewhere in the world have shown its potentials in supplying good quality food proteins for humans and livestock (Osman, 2004; Nkafamiya *et al*., 2007). This study investigate the used of baobab seed meal as a protein source in the diets of Yankasa rams.

MATERIALS AND METHODS

The experiment was conducted at the Abubakar Tafawa Balewa University, Bauchi Teaching and Research farm, located at Yelwa along Tafawa Balewa Road, Bauchi State.

Experimental animals and their management

Sixteen (16) growing Yankasa rams with a mean weight of 16.93 kg were used in the study. The feed ingredients were purchased from livestock Markets (Durun) in Bauchi State. The animals were quarantined for a period of two weeks during which they were given prophylactic treatments. The rams were group fed and managed intensively during a 2-week adaptation period prior to the commencement of the experiment.

Experimental Diets and Animal Feeding

Baobab seed meal used in the experiment was purchased in a local factory in Kano State. It was milled and used to compound the experimental diets, other ingredients included maize offal, cotton seed cake, bone meal, salt and molasses. Four diets containing 16% CP were formulated such that baobab seed meal replaced cowpea husk at 0, 10, 20 and 30% inclusion levels which designated as diets A, B, C and D respectively. Feeds were offered *ad libitum*. The left over for each animal was measured the following morning before serving the day's feed to ascertain feed intake per day. Ingredients composition of the experimental diets is shown in Table 1 below.

Experimental design

Completely Randomised Design (CRD) was used in the study as outlined by Steel and Torrie (1980). Sixteen (16) Yankasa rams were assigned to four (4) dietary treatments coded as Diets A, B, C and D respectively with four (4) animals per treatment.

Table 1: Ingredient Composition of the Experimental Diets

Ingredients (%)	Treatments A (0%)	B (10%)	C (20%)	D (30%)
Maize offal	42.00	45.00	48.00	51.00
Cowpea husks	30.00	20.00	10.00	0.00
Baobab seed meal	0.00	10.00	20.00	30.00
Cotton seedcake	20.50	17.50	14.50	11.50
Molasses	5.00	5.00	5.00	5.00
Bone meal	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00

A= 0% inclusion level, B= 10% inclusion level, C= 20% inclusion level and D= 30% inclusion level.

Data Collection

Blood samples were collected from two (2) animals in each treatment during the last week of the study. The blood samples were collected from the jugular vein as outlined by Coles (1986). Bleeding was done early morning before feeding. About 7ml of the blood sample was collected from each animal. 3ml was placed in sample bottle containing EDTA for the determination of haemoglobin (Hb), packed cell volume (PVC), erythrocyte (RBC) and leucocyte (WBC) according to the methods described by Yakubu *et al.* (2017). Calculation of the erythrocyte indices including mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were derived from the values obtained from red blood cells (RBC).

The remaining 4ml was placed in a universal bottle and allowed to stand for about 2 hours at room temperature, to allow for coagulation to take place. The universal bottle was thereafter used to centrifuge at 4000RP/M for 5 minutes to separate the serum. The serum was used to analyse for blood urea nitrogen (BUN), total protein (TP), albumin, glucose (GLU), Aspartate amino transferase (AST), and alanine amino transferase (ALT), alkaline phosphate (ALP) according to the methods described by (Aljameel *et al.* (2017).

Chemical Analysis

Samples of all diets and faeces were collected for chemical analysis. The samples were analysed for dry matter, crude protein, either extract, crude fiber, nitrogen free extract and ash content according to AOAC (2005). Neutral detergent fibre (NDF) and acid detergent fibre (ADF) were analysed following the procedure of Van Soest *et al*. (1991).

Data Analysis

Data generated from the study were subjected to analysis of variance (ANOVA) using SPSS version 24. Where differences in means existed, Duncan's Multiple Range Test was used to separate the means.

RESULTS AND DISCUSSION

The proximate composition of the experimental diets are shown in Table 2. Dry matter content ranged from 88.64% in diet D to 89.81% in diet A. Organic matter content were 82.12%, 81.73%, 80.82% and 80.49% for Diets A, B, C and D respectively. Crude protein was higher in diets D 17.16% compared to other diets and diet C had the least Crude protein of 16.39%. Neutral detergent fiber were 31.19%, 31.28%, 32.23% and 31.16% for diets A, B, C and D respectively. Acid detergent fiber of the experimental diets ranged from 22.3% in diet A to 24.16% in diet B. Hemicelluloses ranged from 7.12% in diet B to 8.8% in diet A

Table 2: Chemical Composition of Experimental Diets (%)

Components	Treatments A (0)	B (10)	C (20)	D (30)
Dry matter	89.81	89.26	88.93	88.64
Organic matter	82.12	81.73	80.82	80.49
Crude protein	17.10	16.40	16.39	17.16
Neutral detergent fibre	31.19	31.28	32.23	31.63
Acid detergent fibre	22.31	24.16	24.19	23.29
Hemicellose	8.88	7.12	8.04	8.34

A= 0% inclusion level, B= 10% inclusion level, C= 20% inclusion level and D= 30% inclusion level

Haematological Parameters of Yankasa Rams Fed Experimental Diets

The haematological parameters of Yankasa rams fed experimental diets are shown in Table 3. Haemoglobin (Hb) and packed cell volume (PCV) showed no Significant (P>0.05) differences among animals fed experimental diets. The Hb values ranged from 11.15g/dl for animals on diet A to 9.60g/dl for those on diet C. However, diets B and D recorded values 10.45 and 9.90g/dl respectively. The values fell within the range (9.00-15.00 g/dl) for healthy sheep as obtained in Merk (2011). Also, the values in this study were lower than 9.45 to 11.70 g/dl obtained by Ikyume *et al*. (2018) for West African Dwarf goats fed fermented baobab seed meal. The differences could be as a result of the fermentation of the baobab seed meal. PCV values ranged from 32.00% for diet C to 46.35% in diet D while diets A and B were 42.00 and 41.30% respectively. Packed cell volume was higher than the range of 22.40-33.12% reported by Ikyume *et al*. (2018) for West African Dwarf goats fed fermented baobab seed meal. This could be due to specie differences and the kind of baobab component used. The increase in PCV in the current study could mean that the test material improved transport of oxygen and absorbed nutrients thus, resulting in an increased primary and secondary polycythemia and could have been responsible for a better feed conversion ratio in the animal group. Red Blood Cell (RBC) and white blood cell (WBC) were not significantly (P>0.05) influenced across the diets. The RBC values were 10.14, 9.53, 7.90 and 7.42 in diets A, B, C and D respectively. The RBC values obtained in this work were within the normal range for healthy sheep (5-10×10^{12}/L). The WBC values ranged from 6.25×10^{6}/L for diet D to 11.90×10^{6}/L for diet A while 7.65×10^{6}/L and 8.75×10^{6}/L were recorded for diets B and C. These values were within the range of 3.20- 15.80×10^{6}/L reported for Awassi sheep Daramola *et al*. (2005) and the values were within normal rangr for healthy animals (Resource Animal Research, 2009). Mean Corpuscular Volume (MCV) values ranged from 40.50fl in diet C to 43.33fl in diet B. The values also fall within normal range for healthy sheep (23 - 48). The Mean Corpuscular Haemoglobin (MCH) and the Mean Corpuscular Haemoglobin Concentration (MCHC) values were not influenced (P>0.05) by the experimental diets. MCH values ranged from 10.96g/dl in diet B to 13.34g/dl in diet D, while MCHC values ranged from 21.35g/dl in diet D to 30.00g/dl in diet C. In diets A and B, values of 26.54g/dl and 25.30g/dl respectively.

Table 3: Haematological Parameters of Growing Yankasa Rams Fed Experimental Diets

	Treatments					
Parameters	A (0%)	B(10%)	C(20%)	D(30%)	SEM	*Normal values
Haemoglobin (g/dl)	11.15	10.45	9.60	9.90	0.52^{NS}	8.00-16.00
Packed Cell Volume(%)	42.00	41.30	32.00	46.35	6.16^{NS}	24-49
Red Blood Cell (10^{12}/L)	10.14	9.53	7.90	7.42	0.55^{NS}	5-10
White Blood Cell(10^{6}/L)	11.90	7.65	8.75	6.25	1.53^{NS}	4-12
MCV (FI)	41.42	43.33	40.50	42.46	6.58^{NS}	23-48
MCH (g/dl)	10.99	10.96	12.15	13.34	0.67^{NS}	8-12
MCHC(g/dl)	26.54	25.30	30.00	21.35	2.51^{NS}	31-34

[abc]Means in the same row with different superscripts differ significantly (P<0.05), NS=not significant, SEM=standard error of mean, MCHC= mean corpuscular haemoglobin concentration, MCV= mean corpuscular volume, MCH= mean corpuscular haemoglobin.
Research Animal Resource (2009).
A= 0% inclusion level, B= 10% inclusion level, C= 20% inclusion level and D= 30% inclusion level

Serum Biochemical Parameters of Yankasa Rams Fed Experimental Diets

The serum biochemical indices of Yankasa rams fed experimental diets are shown in Table 4.
Glucose (TG) values were not significantly (P<0.05) affected by the dietary treatment. Values ranged from 2.40 mg/dl for animals in diet B to 3.20 mg/dl for those in diet D. Treatments A and C recorded values of 3.05 mg/dl and 2.85 mg/dl respectively. Glucose concentrations were within the normal range of 2.4 to 4.5 as reported by Merck (2011).Total protein (TP) levels were also not significantly (P<0.05) influenced by the experimental diets. The values ranged from 5.20 g/dl in diet B to 6.05 g/dl in diet D, while diets A and C had 5.55 g/dl and 5.30 g/dl. Respectively. However, the presence results are lower than 7.05 g/dl reported by Audu *et al*. (2017) for Uda sheep fed graded levels of residues from Rhizobium inoculated soybean genotype diets. Albumin values were 3.50g/dl, 3.35g/dl, and 2.75g/dl in diets A, C and D respectively. Urea nitrogen levels were also not significantly (P>0.05) different. The values ranged from 4.00 mmol/L to 5.55 mmol/L. which are lower than the (14.00

mmol/L obtained) by Audu *et al*., (2017) for Uda sheep fed graded levels of residues from Rhizobium inoculated soybean genotype diets. The present values however, are within the normal range for healthy sheep (3.7 – 9.3 mmol/L).

Table 4: Serum Biochemical Parameters of Yankasa Rams Fed Experimental Diets.

	Treatments					
Parameters	A (0%)	B(10%)	C(20%)	D(30%)	SEM	Reference values
Glucose(mg/dl)	3.05	2.40	2.85	3.20	0.25^{NS}	2.4-4.5
Protein (g/dl)	5.55	5.20	5.30	6.05	0.42^{NS}	5.9-7.8
Albumin (g/dl)	3.50	3.50	3.35	2.75	043^{NS}	2.7-3.7
Urea (mmol/L)	5.55	4.00	4.15	4.75	0.68^{NS}	3.7-9.3

[abc]Means in the same row with different superscripts differ significantly (P<0.05), NS=not significant, SEM=standard error of mean.
Reference Values, Radostis *et al*. (2000)
A= 0% inclusion level, B= 10% inclusion level, C= 20% inclusion level and D= 30% inclusion level

CONCLUSION

The results obtained from this study indicated that baobab seed meal had no detrimental effect on the haemato-biochemical status of the Yankasa rams. It is recommended that Baobab seed meal should be used to replace protein source in the diets of ruminant animals.

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